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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

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EP/04/13184

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Food composition

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Nestlé

NO 7686

Patent Application
In the name of Nestec S.A.

Title: **Food Composition**

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Food Composition

The present invention relates to a composition intended for the prevention, alleviation and/or treatment of arthritis and osteoarthritis, in the acute and chronic forms and more generally of all pathological conditions originating from metabolic disorders of the osteo-articular tissue and maintenance of joint health in mammals. The present invention comprises as an active ingredient an effective amount of at least one plant or derived-plant extract selected and processed for its content in glucosamine.
The present invention relates to a natural, non-animal or microorganism derived source of glucosamine for the preparation of various ingredients/food/feed/pet food products preventing osteoarthritis, i.e. the first intrinsically enriched plant species in glucosamine, and the classes of ingredients/food/feed/pet food products derived from the invention.

Background of the Invention

Prevention of osteoarthritis (OA)

From a human perspective, OA is a crippling disease with high socio-economic impact.
OA is a heterogeneous group of conditions, including
Primary OA (e. g. genitive factors, hormonal factors, mechanical stress to joints) and
Secondary OA (e. g. inflammatory episodes, post-traumatic).
It is the leading cause of disability with about 43 million people affected in the US and 240 million worldwide. It has substantial economic impact (e. g. in the US direct treatment costs $ 10,7 billion, indirect costs $ 42,8 billion (missed working days)
Symptoms are pain, hypertrophy and stiffness of joints and limitation of movement.
There is no therapy available that alters natural history and current therapy focuses on pain relief with non-steroidal anti-inflammatory drugs (NSAIDs).

From a pet perspective, osteoarthritis is an age- and weight-related degenerative problem of the joints. It affects 20 Mio dogs worldwide: dog have trouble in getting up and jumping, are sore after exercise, and/or grumpy. Because of joint degeneration, inflammation sets on.

Research has also shown that 90% of the cats above 12 years of age show signs of degenerative joint disease (DJD)

Upto now there is no cure, but natural therapeutic treatments (glucosamine and glucosaminoglycans) seem to be very effective in slowing progression of disease.

Use of glucosamine

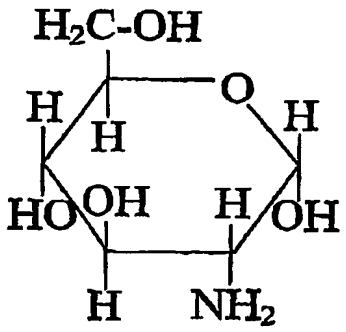
The use of pure glucosamine in the treatment of joint diseases is widely described in the patent as well as in the scientific literature, usually in combination with other compounds or extracts from various natural sources. Pure glucosamine is added as glucosamine hydrochloride or glucosamine sulphate, and comes from shellfish hydrolysis. For example, WO20000074696 describes "herbal compositions comprising glucosamine and *Trypterygium wilfordii, Ligustrum lucidum* and/or *Erycibe schmidtii*, for treating inflammation or degeneration of joint tissues, e.g. arthritis" where pure glucosamine is mixed with plant preparation. Other patents relate to compositions of plant carbohydrates as dietary supplements (EP1172041 or EP0923382) where glucosamine is originated from chitin.

The use of glucosamine as an anti-osteoarthritis agent has been intensively developed during the last decade. Glucosamine is suspected to be the sole active compound on joint disease such as osteoarthritis (up to recently only symptomatic treatment such as non-steroidal anti-inflammatory drugs have been sought to be efficient). The first scientific evidence of the effect of glucosamine was published in 2001 (Long term effects of glucosamine sulphate on osteoarthritis progression: a randomised, placebo controlled clinical trial. Reginster et al, 2001, The Lancet, 357, 251-256) and recent publications reinforce this evidence such as the one of Braham et al. (The effect of glucosamine supplementation on people experiencing regular knee pain, British Journal of Sport Medicine, 37 (1) 45-49, 2003).

Origin of glucosamine

Glucosamine is a naturally occurring derivative of glucose and is an essential component of glycoproteins and proteoglycans, important constituents of many eukaryotic proteins.

It has the following formula :



Glucosamine in animals:

Glucosamine is a constituent of glycosaminoglycans in cartilage matrix and synovial fluids. They are in form of polymers of glucosamine, with an acetyl group attached to a variable number of the individual glucosamine molecules (making them acetylglucosamine).

A polymer composed totally of acetylglucosamine is called chitin, and one composed totally of glucosamine is called chitosan. The structure of chitin is very similar to cellulose, especially because they both are β (1-4) linked.

The main sources of chitin are the following (in % of total dry matter)

Fungi	5-20%
Worms	20-38%
Squids/Octopus	3-20%
Scorpions	30%
Spiders	38%
Cockroaches	35%

Water Beetle	37%
Silk Worm	44%
Hermit Crab	69%
Edible Crab	70%

Glucosamine in plants:

N-Glycosylproteins, which are N-linked glycoproteins, are present in plants in trace amounts. For example, a glucosamine residue of oligosaccharide is N-glycosidically attached to the amide nitrogen of an asparagine residue of the protein. Examples are phaseolin, legumin, bromelain, laccase, etc. Degradation occurs through the activity of enzymes for de-N-glycosylation (cleavage of glycosamine linkage between N-acetyl -D glucosamine and Asp. residue).

N-Glycosylproteins are different from chitin, found in the extracellular matrix, in the vacuole, associated to membranes (Endoplasmic Reticulum, Golgi, tonoplast, plasma membrane). N-glycans influence the stability, solubility, and biological activity of the protein. De-N-glycosylation seems important during germination and post germinative development.

Such a linked-glucosamine is in limited quantities and not freely available (or through hydrolysis such as strong acidic or enzymatic treatment).

Free glucosamine has never been observed in plant species or as trace levels as in our own measurements (as examples less than 1 mg/kg dry matter of chicory, carrot or jerusalem artichoke raw material).

Industrial sources of glucosamine

Industrial glucosamine is a pure compound obtained from the acidic hydrolysis of chitin from shellfish, a complex carbohydrate derived from N-acetyl-D-glucosamine. Glucosamine can also be produced from enzymatic hydrolysis of shellfish, microbial fermentation (for example with of corn-derived products).

Patents have been filed protecting fermentation processes (thus micro organisms) leading to the production of glucosamine. All these processes concern the production of pure, extracted glucosamine, in competition with shellfish extracts.

As an example, US patent 6,486,307 describes an improved method for chitin acidic hydrolysis: A method of producing glucosamine hydrochloride from chitin by grinding the chitin to a very fine-size and digestion with concentrated hydrochloric acid.

US patent 6,372,457 describes a method and material for producing glucosamine by fermentation of a genetically modified microorganism.

US patent 5,998,173 describes a novel process for directly producing N-acetyl-D-glucosamine from chitin utilizing an ensemble of the chitinase family of enzymes to hydrolyse chitin of crustacean shells.

Summary of the invention

Accordingly, in a first aspect, the present invention provides an orally ingestible composition intended for the prevention, alleviation and/or treatment of arthritis and osteoarthritis complaints, in the acute and chronic forms and, generally of all pathological conditions originating from metabolic disorders of the osteo-articular tissue and maintenance of joint health in mammals. It comprises as an active ingredient an effective amount of at least one plant or derived-plant extract selected and processed for its content in glucosamine.

Surprisingly, it has now been found that glucosamine can be formed during drying process of some plant raw materials.

The present invention describes new sources of glucosamine from plants in order to develop food, feed or pet food ingredients from plant material intrinsically containing free glucosamine, acting as preventive, curative and/or alleviative agent of osteoarthritis.

The plants and derived-plant extracts containing glucosamine can be claimed as all natural, plant derived, non-GMO, usable in vegetarian food, processable to satisfy Halal or specifications.

The composition according to the invention can be used in the manufacture of a nutritional product, a supplement, a treat or a medicament intended for humans or pets.

In addition, the invention provides a method of prevention, alleviation and/or treatment of joint disorder or maintenance of joint health that comprises administering an effective amount of a composition as described above.

It further relates to a method for the treatment, alleviation and/or prophylaxis of osteoarthritis in humans, pets or horses, comprising the step of feeding an individual, a composition as described above.

Detailed Description of the Invention

In the present specification, the word "pet" as to be understood as comprising dogs, cats, rabbits, guinea pigs, mice, rats, birds (for example parrots), reptiles and fish (for example goldfish). However, the term also includes other domesticated animals, such as livestock, for example, cattle, horses, pigs, sheep, goats, buffaloes, camels, and the like. Horses for example are known to suffer from OA.

In the present specification, by "orally ingestible composition" it has to be understood any composition that can be ingested by mammals, including humans or pets. It encompasses enteral compositions, parenteral compositions, nutritional supplements, medicines, pills, tablets, nutritionally complete diets, treats for pets, as well as any type of usual food products, such as, for examples, confectionery, pastries, milk-containing products, cereals, biscuits, sugar-based and fat-based confectionery products, drinks, liquid compositions and the like.

In the present specification, by "high amount of glucosamine" it has to be understood that the amount of glucosamine is higher than traces of glucosamine. It should be understood as glucosamine present in amounts above 150 mg per kg dry matter of raw material, preferably above 300 mg per kg dry matter of raw material, and most preferably above 500 mg per kg dry matter of raw material.

With respect to the first object of the present invention, the plant or derived-plant extract according to the invention are processed to contain natural free glucosamine.

In a preferred embodiment, the plant or plant extract is from any part of the plant, e.g. leaves, tubers, fruits, seeds, roots, grains, embryos or cell cultures. The plant or plant extract may be in the form of a dried, lyophilised extract of leaves, roots and/or fruits depending on the source of plant, or fresh plant, or enriched fraction obtained by a controlled drying process.

It comprises as an active ingredient an effective amount of at least one plant or derived-plant extract selected and processed (dried) for its content in glucosamine.
The plant or derived-plant extract is selected for its ability to generate free glucosamine through drying process; in particular it may be selected from the group consisting of plant species containing sucrose, fructose or inulin such as Cichorium, Daucus, Helianthus.
In a most preferred embodiment it may be for example root of Chicory (*Cichorium intybus*), carrot (*Daucus carota*), tuber of Jerusalem artichoke (*Helianthus tuberosum*).
Through the drying process, the obtained quantities of glucosamine are higher than 150 mg per kg dry matter of chicory root, 100 mg per kg dry matter of carrot root, or 50 mg per kg dry matter of jerusalem artichoke tubers.

In a further most preferred embodiment, the plant material is harvested, cut and dried in an oven or in an industrial dryer at a temperature between 70 and 140°Celsius for 5 min to 140 hours. Although not wishing to be bound by theory, we believe that it is preferable to cut the plant material in slices or cubes, preferably having a maximum

width of 5 cm. The inventors indeed believe that it is important for the present invention in order to reach optimized thermodynamic exchanges.

Still not wishing to be bound by theory, we also believe that glucosamine is not coming from the direct degradation of macromolecules with the subsequent release of free glucosamine, but is likely due to the release of free fructose and amino acids during the drying of the plant material, following by the first steps of a Maillard reaction. The mechanism of the Maillard reaction is complex. However, it is generally divided into three stages:

(1) The first stage involves the sugar-amine condensation and the Amadori rearrangement. No browning occurs at this stage.

(2) The second stage involves sugar dehydration and fragmentation, and amino acid degradation via the Strecker reaction especially at high temperatures, as used in candy manufacture, for example at the end of this stage, there is a beginning of flavor formation-depending on which flavor is studied.

(3) Formation of heterocyclic nitrogen compounds. Browning occurs at this stage.

Although not wishing to be bound by theory, the present invention may report specific conditions allowing the first step of the formation of the reaction chain, leading to accumulate glucosamine through Heyns/Amadori reactions. Specifically during the first step, it is known that ketoses, such as fructose, react with amines to form aminoaldoses, in a reaction called the Heyns reaction. The intermediates to this reaction are imines. Aminoaldoses are not very stable and readily react forming the Amadori compound.

The course of the reaction is strongly affected by factors that influence the different chemical reactions involved. These are:

- -Temperature and duration of heating
- -pH and presence of weak acids and bases
- -Water content
- -Type of reactant
- -Amino acid to sugar ratio
- -Oxygen

The plant or derived-plant extract according to the invention may be used in the preparation of a food composition without further treatment or extraction. The said composition may be in the form of a nutritionally balanced food or pet food, a dietary supplement, a treat or a pharmaceutical composition.

The plant or derived-plant extract may be used alone or in association with other plants such as chicory, tea, cocoa, and/or with other bioactive molecule such as antioxidants, fatty acids, prebiotic fibres, chondroitin sulphate, among others.

In one embodiment, a food composition for human consumption is prepared. This composition may be a nutritional complete formula, a dairy product, a chilled or shelf stable beverage, a soup, a dietary supplement, a meal replacement, and a nutritional bar or a confectionery product.

Apart from the plant or derived-plant extract according to the invention, the nutritional formula may comprise a source of protein. Dietary proteins are preferably used as a source of protein. The dietary proteins may be any suitable dietary protein; for example animal proteins (such as milk proteins, meat proteins and egg proteins); vegetable proteins (such as soy protein, wheat protein, rice protein, and pea protein); mixtures of free amino acids; or combinations thereof. Milk proteins such as casein, whey proteins and soy proteins are particularly preferred. The composition may also contain a source of carbohydrates and a source of fat.

If the nutritional formula includes a fat source, the fat source preferably provides about 5% to about 55% of the energy of the nutritional formula; for example about 20% to about 50% of the energy. The lipids making up the fat source may be any suitable fat or fat mixtures. Vegetable fats are particularly suitable; for example soy oil, palm oil, coconut oil, safflower oil, sunflower oil, corn oil, canola oil, lecithins, and the like. Animal fats such as milk fats may also be added if desired.

A source of carbohydrate may be added to the nutritional formula. It preferably provides about 10% to about 80% of the energy of the nutritional composition. Any suitable carbohydrate may be used, for example sucrose, lactose, glucose, fructose, corn syrup solids, and maltodextrins, and mixtures thereof. Dietary fibre may also be added if desired. If used, it preferably comprises up to about 5% of the energy of the nutritional formula. The dietary fibre may be from any suitable origin, including for example soy, pea, oat, pectin, guar gum, gum arabic, and fructooligosaccharides. Suitable vitamins and minerals may be included in the nutritional formula in an amount to meet the appropriate guidelines.

One or more food grade emulsifiers may be incorporated into the nutritional formula if desired; for example diacetyl tartaric acid esters of mono- and di-glycerides, lecithin and mono- and di-glycerides. Similarly, suitable salts and stabilisers may be included.

Vitamins and minerals may also be combined with the plant or derived-plant extract.

The nutritional composition may be enterally administrable; for example in the form of a powder, tablet, capsule, a liquid concentrate, solid product or a ready-to-drink beverage. If it is desired to produce a powdered nutritional formula, the homogenized mixture is transferred to a suitable drying apparatus such as a spray drier or freeze drier and converted to powder.

In another embodiment, a nutritional composition comprises a milk-based cereal together with a prebiotic formulation. Preferably, the milk-based cereal is an infant cereal, which acts as a carrier for the prebiotic formulation.

In another embodiment, a usual food product may be enriched with at least one plant or derived-plant extract according to the present invention. For example, a fermented milk, a yoghurt, a fresh cheese, a renneted milk, article of confectionery, for example a sweet or sweetened beverage, a confectionery bar, breakfast cereal flakes or bars, drinks, milk

powders, soy-based products, non-milk fermented products or nutritional supplements for clinical nutrition.

The amount of the plant or derived-plant extract in the composition may vary according to the plant source and its utilization. In a preferred embodiment, an efficient daily dose amount is of at least about 1 mg, and more preferably from 1 mg to 1500mg of the active molecule per day, and more preferably around 300 to 400 mg for a 15 kg dog.

The plant or derived-plant extract according to the invention may be used in the preparation of a pet or a horse food composition. The said composition may be administered to the pet or horse as a supplement to its normal diet or as a component of a nutritionally complete pet or horse food. It may also be a pharmaceutical composition.

The plant or derived-plant extract may be used alone or in association with other plants such as vegetables, tea, cocoa, or with other bioactive molecules such as antioxidants, fatty acids, prebiotic fibers, chondroitin sulphate for example.

Preferably, the pet food composition comprises about 0.01 to 0.5 g (1 to 50%) of dry plants per gram of dry pet food for a 15 kg dog; and 0.001 to 0.1 g (0.1 to 10%) of dry plants per gram of wet pet food for a 15 kg dog.
The nutritionally complete pet food composition according to the invention may be in powdered, dried form, a treat or a wet, chilled or shelf stable pet food product. These pet foods may be produced by ways known in the art. Apart from the plant or derived-plant extract, these pet foods may include any one or more of a starch source, a protein source and a lipid source.

The choice of the starch, protein and lipid sources will be largely determined by the nutritional needs of the animal or the human, palatability considerations, and the type of product applied in pet food. Furthermore, the starch sources may include one or more of rice, barley, wheat and corn.

The pet food may optionally also contain a prebiotic, a probiotic microorganism or another active agent, for example a long chain fatty acid. The amount of prebiotic in the pet food is preferably less than 10% by weight. For example, the prebiotic may comprise about 0.1% to about 5% by weight of the pet food.

For pet foods, which use chicory as the source of the prebiotic, the chicory may be included to comprise about 0.5% to about 10% by weight of the feed mixture, more preferably about 1% to about 5% by weight.

If a probiotic microorganism is used, the pet food preferably contains about 10^4 to about 10^{10} cells of the probiotic microorganism per gram of the pet food; more preferably about 10^6 to about 10^8 cells of the probiotic microorganism per gram. The pet food may contain about 0.5% to about 20% by weight of the mixture of the probiotic micro-organism; preferably about 1% to about 6% by weight; for example about 3% to about 6% by weight.

If necessary, the pet food is supplemented with minerals and vitamins so that they are nutritionally complete. Further, various other ingredients, for example, sugar, salt, spices, seasonings, flavouring agents, and the like may also be incorporated into the pet food as desired.

For dried pet food, a suitable process is extrusion cooking, although baking and other suitable processes may be used. When extrusion cooked, the dried pet food is usually provided in the form of a kibble. If a prebiotic is used, the prebiotic may be admixed with the other ingredients of the dried pet food before processing. A suitable process is described in European patent application No 0850569. If a probiotic microorganism is used, the organism is preferably coated onto or filled into the dried pet food. A suitable process is described in European patent application No 0862863.

For wet food, the processes described in US patents 4,781,939 and 5,132,137 may be used to produce simulated meat products. Other procedures for producing chunk type products may also be used; for example cooking in a steam oven. Alternatively,

emulsifying a suitable meat material to produce a meat emulsion, adding a suitable gelling agent, and heating the meat emulsion before filling into cans or other containers may produce loaf type products.

Administering to a human or animal, the food or pet food composition as described above, results in an improved joint health. This food composition helps to prevent osteoarthritis in pets, humans, and horses, which results in a better activity or mobility of the individual. Further to a better mobility, administering the food or pet food of the invention to a human, a pet or a horse greatly improves the quality of life of the individual; if said individual is a pet, it therefore enriches and improves the interaction between the pet and its owner, as well as it enriches the relashionship between said pet and said owner.

Examples

The following examples are illustrative of some of the products and methods of making the same falling within the scope of the present invention. They are not to be considered in any way limitative of the invention. Changes and modifications can be made with respect to the invention. That is, the skilled person will recognise many variations in these examples to cover a wide range of formulas, ingredients, processing, and mixtures to rationally adjust the naturally occurring levels of the compounds of the invention for a variety of applications.

Example 1: Chicory intrinsically enriched in free glucosamine

Drying:

After harvest, 70g (fresh weight) roots of chicory (*Cichorium intybus*) are cut in slices of 1x1 cm, and then dried in an oven at a temperature of 92°C for 72 h.

Analysis:

Extraction of glucosamine:

2g of ground and specifically dried chicory root are extracted with 20ml of water at room temperature for 1 minute. The solution is filtered on filter Schleicher & Schultz

(n°597) or centrifuged. A purification step of the solution is performed using a cation exchange column (Oasis cartridge WATERS, MCX type, ref. 186 000 776). Basic compounds entrapped on the matrix are eluted with MeOH/NH_4OH 2% (v/v). After filtration, an aliquot is used for direct injection on LC system (DIONEX).

Separation:
Analysis is carried out with a HPAE/PED system using an ion exchange PA1 column (4*250mm) with DIONEX DX 500 apparatus.

Programme:
ELUTION (%)

Time (min)	H_2O	0.1M NaOH	0.25 NaOH	Comment
0	85	15	0	Balancing
60	85	15	0	
60.1	0	0	100	Washing
70	0	0	100	
70.1	85	15	0	Balancing
90	85	15	0	

Flow: 1ml/min. Volume of injection: 20µl. Standard: Glucosamine from Sigma (ref: G4875).

In these conditions, glucosamine has a retention time of round 11 min and is easily detected for further quantification in chicory extracts properly processed. A concentration of 350 mg/kg dry weight has been quantified by this method in the present example, instead of less than 1 mg/kg without drying process.

Confirmation of the presence of glucosamine:
In order to confirm the presence of glucosamine in chicory plant extracts, three different qualitative techniques have been evaluated.

Thin layer chromatography (TLC)

Pure glucosamine and plant extracts were analysed on HPTLC (High Performance Thin Layer Chromatography) silica gel plates (Merck, ref. 1.05642) with Ethyl acetate/MeOH/water (50/50/10; V/V/V) as eluant. After elution, the plates are sprayed with an acetic acid solution of ninhydrine 1% and heated at 120°C for 10min. One spot appeared in a pink/blue color at the same rate factor (Rf) for the reference and extracts.

Chemical degradation

In the presence of ninhydrine, an oxidative de-amination occurs with glucosamine, which leads to the release of arabinose easily detected through routine sugar LC analysis. Presence of arabinose with control and chicory extracts was unambiguously confirmed.

Derivatization of glucosamine

Reverse phase chromatography using pre-column derivatization with phenylisothiocyanate and UV detection (λ=254nm) was used with the pure compound and plant extracts as described by Zhongming et al.: "Determination of nutraceuticals, glucosamine hydrochloride in raw materials, dosage form and plasma using pre-column derivation with UV HPLC. In J. of Pharmaceut. and Biomed. Analysis, 1999 (20), 807-814."

The corresponding peak of derivatized glucosamine was detected in chicory extracts as well as with pure compound.

Example 2 : Carrot enriched in free glucosamine

70g (fresh weight) of carrot roots are cut in slices of 1x1cm then dried in an oven at a temperature of 110°C for 7 h. Extraction and analysis are performed as in example 1, leading to a glucosamine concentration of 190mg /kg dry weight, instead of less than 1mg / 1kg without drying process.

Example 3: Dry pet food with chicory

A feed mixture is made up of about 58% by weight of corn, about 5.5% by weight of corn gluten, about 22% by weight of chicken meal, 2.5% chicory roots previously dried according to the process described above, salts, vitamins and minerals making up the remainder.

The feed mixture is fed into a preconditioner and moistened. The moistened feed is then fed into an extruder-cooker and gelatinised. The gelatinised matrix leaving the extruder is forced through a die and extruded. The extrudate is cut into pieces suitable for feeding to dogs. The pieces are then dried to a moisture content of about 1% by weight.

This dry dog food has a positive effect on cartilage health and increases their mobility.

Example 4: Wet canned pet food with supplement

A mixture is prepared from 73 % of poultry carcass, pig lungs and beef liver (ground), 16 % of wheat flour, 2 % of dyes, vitamins, and inorganic salts. This mixture is emulsified at 12°C and extruded in the form of a pudding, which is then cooked at a temperature of 90°C. It is cooled to 30°C and cut in chunks. 45 % of these chunks are mixed with 55 % of a sauce prepared from 98 % of water, 1 % of dye, and 1 % of guar gum. Tinplate cans are filled and sterilised at 125°C for 40 min.

As a supplement to be mixed with the pet-food before serving, additional packaging (e.g. sachet) contains 25 g of powdered carrot or chicory or Jerusalem artichoke roots parts, previously dried according to the process described above, to be added to the daily food. The corresponding amount for the pet is about 25 g / day and this can be supplied as a supplement with (e.g. on top of) the can.

Claims

1. Orally ingestible composition comprising as an active ingredient an effective amount of at least one plant or derived-plant extract having a high glucosamine amount.

2. Orally ingestible composition according to claim 1 wherein the plant belongs to the genus Cichorium, Daucus, and/or Helianthus.

3 Orally ingestible composition according to claim 1 or claim 2 wherein the plants are Chicory (*Cichorium intybus*), carrot (*Daucus carota*), and/or Jerusalem artichoke (*Helianthus tuberosum*).

4. Orally ingestible composition according to claims 1 to 3 wherein the plant material or plant extract comes from any part of the plant, such as leaves, tubers, fruits, seeds, roots, grains, embryos and/or cell cultures.

5. Orally ingestible composition according to claims 1 to 4 wherein the glucosamine amount of the used plant part is above 150mg /kg dry matter, preferably above 300 mg/kg dry matter, and most preferably above 500mg kg dry matter.

6 Orally ingestible composition according to claims 1 to 5 wherein glucosamine is in form of free glucosamine.

7. Use of a composition according to claims 1 to 6 for the prevention, treatment and / or alleviation of metabolic disorders of the osteo-articular tissues and/or the maintenance of joint health in mammals.

8. Use of a composition according to claim 7 wherein the metabolic disorders are arthritis, osteoarthritis, and associated disorders.

9. Use of a composition according to claim 7 or 8 wherein the metabolic disorders are in acute of chronic phase.

10. Use of a composition according to claims 7 to 9 wherein the mammals are humans or pets.

11. Use of a composition according to claims 7 or 10 to help building cartilages.

12. Use of a composition according to claims 7 to 11 to improve mobility and/or quality of life of a mammal.

13. Use of a composition according to claim 12 wherein the mammal is a pet, and the use of the composition enriches the relashionship between the pet and its owner an/or the interaction between said pet and said owner.

Abstract

The present invention relates to a composition for maintenance of joint health or prevention, alleviation and/or treatment of osteoarthritis. It also relates to the use of the composition in the manufacture of a nutritional product, a supplement, a treat or a medicament; and a method for the maintenance of bone health, prevention, alleviation and/or treatment of osteoarthritis, which comprises administering an effective amount of the composition.

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